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AMENDMENTS TO THE CLAIMS

1.   (Previously presented) A method for modulation, comprising the steps of:

regularly subjecting an input digital signal to first modulation and second modulation to convert the input digital signal into a pair of a baseband I signal and a baseband Q signal, the first modulation and the second modulation being different from each other; and

outputting the pair of the baseband I signal and the baseband Q signal;

wherein the first modulation is at least 8-signal-point modulation, and the second modulation is phase shift keying;

wherein the phase shift keying provides periodically-spaced symbols which represent corresponding portions of the input digital signal in terms of differences between phases of the periodically-spaced symbols; and

wherein the at least 8-signal-point modulation assigns logic states of the input digital signal to respective signal points for a first symbol in response to a signal point used by a second symbol of the phase shift keying which precedes the first symbol.

2.   Cancelled

3.   (Currently amended) A method as recited in claim 1, wherein the phase shift keying is [quadranture] quadrature phase shift keying.

4.   (Original) A method as recited in claim 2, wherein the phase shift keying is quadrature phase shift keying.

5.   (Currently amended) A method as recited in claim 1, wherein the at least 8-signal-point modulation is at least 8 [quadature] quadrature amplitude modulation.

6.   (Original) A method as recited in claim 4, wherein the at least 8-signal-point modulation is at least 8 quadrature amplitude modulation.

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7.   (Original) A method as recited in claim 5, wherein at least 8 quadrature amplitude modulation is 16 quadrature amplitude modulation.

8.   (Original) A method as recited in claim 6, wherein the at least 8 quadrature amplitude modulation is 16 quadrature amplitude modulation.

9.   (Original) A method as recited in claim 5, wherein the at least 8 quadrature amplitude modulation provides signal points which result from rotation of signal points of at least 8-value normal quadrature amplitude modulation through an angle of $\pi/4$ radian about an origin in an I-Q plane.

10.   (Original) A method as recited in claim 6, wherein the at least 8 quadrature amplitude modulation provides signal points which result from rotation of signal points of at least 8-value normal quadrature amplitude modulation through an angle of $\pi/4$ radian about an origin in an I-Q plane.

11.   (Original) A method as recited in claim 7, wherein the 16 quadrature amplitude modulation provides signal points which result from rotation of signal points of 16-value normal quadrature amplitude modulation through an angle of $\pi/4$ radian about an origin in an I-Q plane.

12.   (Original) A method as recited in claim 8, wherein the 16 quadrature amplitude modulation provides signal points which result from rotation of signal points of 16-value normal quadrature amplitude modulation through an angle of $\pi/4$ radian about an origin in an I-Q plane.

13.   (Previously presented) A method as recited in claim 1, wherein a maximum of amplitudes corresponding to signal points of the at least 8-signal-point modulation in an I-Q plane is equal to an amplitude of a signal point of the phase shift keying in the I-Q plane.

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Claims 14-32 (cancelled).

33.   (Currently amended) A transmission apparatus comprising:

first means for periodically and alternately subjecting an input digital signal to first modulation and second modulation to convert the input digital signal into a pair of a baseband I signal and a baseband Q signal, the first modulation and the second modulation being different from each other, the first modulation being at least 8-signal-point modulation, the second modulation being phase shift keying; [and]

second means for outputting the pair of the baseband I signal and the baseband Q signal;

wherein the first modulation is at least 8-signal-point modulation, and the second modulation is phase shift keying;

wherein the phase shift keying provides periodically-spaced symbols which represents corresponding portions of the input digital signal in terms of differences between phases of the periodically-spaced symbols;

wherein the at least 8-signal-point modulation assigns logic states of the input digital signal to respective signal points for a first symbol in response to a signal point used by a second symbol of the shift keying which precedes the first symbol; and

wherein said first symbol is demodulated by using said second symbol which is not a known prescribed pattern but a part of information transmitted by said transmission apparatus.

Claims 34-36 (cancelled).

37.   (Previously presented) A transmission apparatus as recited in claim 33, wherein the symbols provided by the phase shift keying are used as a pilot symbol for estimating at least one of (1) a transmission path distortion and (2) a frequency offset.

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38.   (Currently amended) A modulation method for modulating an input digital signal into a multi-value symbol stream, the modulation method comprising:

generating a first multi-value modulation signal having first multi-value symbols with a first modulator;

generating a second modulation signal containing second multi-value symbols by using a second modulator which are to be used as pilot symbol estimating at least one of (1) a channel distortion and (2) a frequency offset for demodulating said first multi-value modulation signal in a receiver; [and]

inserting said second multi-value symbols into said first multi-value symbols such that the resultant multi-value symbols constitute said multi-value symbol stream; and

wherein said first symbol is demodulated by using said second symbol which is not a known prescribed pattern but a part of information to be transmitted and received.

39.   (Previously presented) A modulation method as recited in claim 38, (1) said channel distortion and (2) said frequency offset are estimated from each of said second multi-value symbols.

40.   (Previously presented) A modulation method as recited in claim 38, wherein differential encoding is done between symbols of the second modulation signal.

41.   Cancelled

42.   (Currently amended) A modulation method as recited in [one of claims] claim 38, wherein the second modulation signal is obtained by phase shift keying (PSK) modulation.

43.   (Currently amended) A modulation method as recited in claim 42, wherein the second modulation signal is obtained by binary phase shift keying (BPSK) modulation.

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44.   (Currently amended) A modulation method as recited in claim 42, wherein the second modulation signal is obtained by quadrature phase shift keying (QPSK) modulation.

45.   Cancelled

46.   (Currently amended) A modulation method as recited in [one of claims] claim 38, wherein the first modulation signal is obtained by at least 8-value modulation.

47.   (Currently amended) A modulation method as recited in claim 46, wherein the first modulation signal is at least an 8-value quadrature amplitude modulation (QAM).

48.   (Currently amended) A modulation method as recited in [one of claims] claim 38, wherein the first modulation signal is obtained by 16QAM and the second modulation signal is obtained by PSK modulation, and a maximum signal point amplitude of the second modulation system is equal to 0.9 to 1.5 times a maximum signal point amplitude of the first modulation signal.

49.   (Previously presented) A transmission apparatus comprising a first multi-value modulation system for subjecting an input digital signal to first modulation and outputting a first quadrature baseband signal, a second modulation system for subjecting the input digital signal to a second modulation and outputting a second quadrature baseband signal, wherein said second quadrature baseband signal is regularly inserted as a pilot signal into the first quadrature baseband signal wherein said second quadrature baseband signal is used for estimating a frequency offset and a channel distortion in a receiver.

50.   Cancelled

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51.   (Previously presented) A transmission apparatus as recited in claim 49, wherein differential encoding is done between symbols of the second modulation system.

52.   Cancelled

53.   (Previously presented) A transmission apparatus as recited in one of claims 49 or 51, wherein the second modulation system is phase shift keying (PSK) modulation.

54.   (Previously presented) A transmission apparatus as recited in claim 53, wherein the second modulation system is binary phase shift keying (BPSK) modulation.

55.   (Previously presented) A transmission apparatus as recited in claim 53, wherein the second modulation system is quadrature phase shift keying (QPSK) modulation.

56.   Cancelled

57.   (Previously presented) A transmission apparatus as recited in one of claims 49 or 51, wherein the first modulation system is at least 8-value modulation.

58.   (Previously presented) A transmission apparatus as recited in claim 57, wherein the first modulation system is at least 8-value quadrature amplitude modulation (QAM).

59.   (Previously presented) A transmission apparatus as recited in one of claims 49 or 51, wherein the first modulation system is 16QAM and the second modulation system is PSK modulation, and a maximum signal point amplitude of the second modulation system is equal to 0.9 to 1.5 times a maximum signal point amplitude of the first modulation system.

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60.   (Withdrawn) A receiving apparatus for receiving a modulation signal of a first multi-value modulation system, and a modulation signal of a second modulation system which is regularly inserted into the multi-value modulation system, the apparatus comprising:

an estimating portion for extracting a signal estimating a channel distortion of the second modulation system from a quadrature baseband signal of the second modulation system; and

a detecting portion for modulating the first modulation system from the quadrature baseband signal and the transmission path distortion estimation signal, and for outputting data.

61.   (Withdrawn) A receiving apparatus for receiving a modulation signal of a multi-value modulation system of a first modulation system, and a modulation signal of a second modulation system which is regularly inserted into the signal of the multi-value modulation system, the apparatus comprising:

a frequency offset estimating portion for extracting a signal of the second modulation system from a quadrature baseband signal, and for outputting a frequency offset estimation signal; and

a detecting portion for modulating the first modulation system from the quadrature baseband signal with the frequency offset estimation signal.

62.   (Withdrawn) A receiving apparatus for receiving a first modulation signal of a multi-value modulation system, and a second modulation signal of a second modulation system which is regularly inserted into the first multi-value modulation signal, the apparatus comprising:

a channel distortion estimating portion for extracting a signal of the second modulation system of a received quadrature baseband signal of said first and second signals, for estimating a channel distortion, and for outputting a channel distortion estimation signal;

a frequency offset estimating portion for estimating a frequency offset from said extracted signal of the second modulation system, and for outputting a frequency offset estimation signal; and

a detecting portion for modulating the first modulation system signal from the quadrature baseband signal, the channel distortion estimation signal, and the frequency offset estimation signal, and for outputting data.

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63.   (Withdrawn) A receiving apparatus for receiving a first modulation signal of a multi-value modulation system, and a second modulation signal of a second modulation system which is regularly inserted into the first multi-value modulation signal, the apparatus comprising:

a demodulating portion for extracting a signal of the second modulation system from a quadrature baseband signal of said first and second modulation signals, and for outputting corresponding data;

a distortion estimating portion for extracting a signal of the second modulation signal channel of the quadrature baseband signal, for estimating a channel distortion, and for outputting a channel distortion estimation signal; and

a detecting portion for demodulating the first modulation signal from the quadrature baseband signal, and the channel distortion for outputting data of the first modulation signal.

64.   (Withdrawn) A receiving apparatus for receiving a first modulation signal of a multi-value modulation system, and a second modulation signal of a second modulation system regularly inserted into the first modulation signal, comprising:

a demodulating portion for extracting said signal of the second modulation system from a quadrature baseband signal of said first and second modulation signals;

a frequency offset estimating portion for extracting a signal of the second modulation signal of the quadrature baseband signal, for estimating a frequency offset, and for outputting a frequency offset estimation signal; and

a detecting portion for modulating the first modulation signal from the quadrature baseband signal and the frequency offset estimation signal, and outputting data.

65.   (Withdrawn) A receiving apparatus for receiving a first modulation signal of a multi-value modulation system, and a second modulation signal of a second modulation system regularly inserted into the first modulation signal of the multi-value modulation system, comprising:

a demodulating portion for extracting a signal of the second modulation signal from a quadrature baseband signal of said first and second signals for outputting data;

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a channel distortion estimating portion for extracting a signal of the second modulation signal of the quadrature baseband signal for estimating a channel distortion, and for outputting a channel distortion estimation signal;

a frequency offset estimating portion for extracting a signal of the second modulation signal of the quadrature baseband signal, for estimating a frequency offset, and for outputting a frequency offset estimation signal; and

a detecting portion for modulating the first modulation signal of the quadrature baseband signal, the channel distortion estimation signal, and the frequency offset estimation signal, and outputting data.

66.   (Withdrawn) A receiving apparatus as recited in one of claims 63, 64 or 65, wherein a detection system for the second modulation signal is delay detection.

67.   (Withdrawn) A receiving apparatus as recited in one of claims 63, 64, 65 or 66, wherein a detecting portion for the first modulation system is quasi synchronous detection.

68.   (Withdrawn) A receiving apparatus as recited in one of claims 63, 64, 65, 66 or 67, wherein the second modulation system is phase shift keying (PSK) modulation.

69.   (Withdrawn) A receiving apparatus as recited in claim 68, wherein the second modulation system is binary phase shift keying (BPSK) modulation.

70.   (Withdrawn) A receiving apparatus as recited in claim 68, wherein the second modulation system is quadrature phase shift keying (QPSK) modulation.

71.   (Withdrawn) A receiving apparatus as recited in one of claims 63, 64, 65, 66 or 67, wherein the first modulation system is quadrature phase shift keying (QPSK) modulation.

72.   (Withdrawn) A receiving apparatus as recited in one of claims 63, 64, 65, 66 or 67, wherein the first modulation system is at least 8-value modulation.

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73. (Withdrawn) A receiving apparatus as recited in claim 72, wherein the first modulation system is at least 8-value quadrature amplitude modulation (QAM).

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